Exam Code: 121303 **Paper Code: 3182**

Programme: Bachelor of Science (Semester: III)

Course Title: Zoology (Evolution)

Course Code: BSMM-3483 (I)

Time Allowed: 3 Hours **Max Marks: 40**

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 08 marks.

Section – A

Q1. a. What are homologous organs. Explain with suitable examples. 4

b. Explain connecting links in detail with examples. 4

Q2. Discuss theory of Lamarckism in detail. 8

Section – B

Q3. Describe in detail chemical evolution of origin of life. 8

Q4. What is speciation. Discuss in detail types and modes of speciation. 8

Section – C

Q5. What are fossils. Explain in detail with examples. 8

Q6. Discuss in detail origin and extinction of reptiles. 8

Section – D

Q7. Explain in detail parental care in Pisces. 8

Q8. Write short notes on

a. Fish migration. 4

b. Dentition in mammals. 4

Exam Code: 121303 **Paper Code: 3183**

Programme: Bachelor of Science (Medical)

Semester: III

Course Title: Zoology (Biodiversity-III)

Course Code: BSMM-3483 (II)

Time Allowed: 3 Hours **Max Marks: 60**

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 12 marks. Draw diagrams wherever necessary.

Section A

1. Describe the Blood vascular system of *Herdmania*. (12)
2. Write a detailed note on morphological features of *Amphioxus*. (12)

Section B

3. Give a detailed account on affinities of Cyclostomates with respect to other phyla. (12)
4. Describe the respiratory system of *Labeo rohita*. (12)

Section C

5. Write in detail the digestive system of *Rana tigrina*. (12)
6. Explain the circulatory system of *Uromastix*. (12)

Section D

7. Explain the nervous system of Pigeon. (12)
8. Write a detailed account of circulatory system in case of Rat. (12)

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Exam Code: 121303 **Paper Code: 3184**

Programme: Bachelor of Science

Semester – III

Course Title: Microbiology

(Microbial Nutrition and Metabolism)

Course Code: BSMM-3343

Time Allowed: 3 Hours **Max. Marks: 60**

Instructions for students:
Candidates are required to attempt five questions in all, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks.

Section – A

1. a) Explain the role of micronutrients in microbial growth. Give examples.
   b) Describe different types of media used for microbial growth.
2. a) Differentiate between photolithotrophs and photoorganotrophs.
   b) What essential factors should be taken into account when designing a culture medium for microorganisms?

Section – B

3. a) What is passive transport, and how does it differ from active transport?

b) Explain the first and second laws of thermodynamics.

4. a) What is the relationship between entropy, enthalpy, and free energy in biochemical reactions?

b) Write a note on role of bioenergetics in cellular metabolism.

Section – C

5. a) Describe the glycolytic pathway and its importance in glucose metabolism in bacteria.

b) Explain the processes by which bacteria degrade and metabolize starch.

6. a) Discuss the role of the electron transport chain (ETC) in aerobic respiration in bacteria and how it contributes to ATP synthesis.

b) Describe the Krebs cycle (TCA cycle) and its role in bacterial energy metabolism.

Section – D

7. a) Write a short note on synthesis of purine nucleotides.

b) Explain the Michaelis-Menten equation and its significance in enzyme kinetics.

8. a) Explain the process of nitrogen assimilation in bacteria.

b) Discuss the role of allosteric enzymes in metabolic regulation.

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Exam Code: 121303 **Paper Code: 3185**

Bachelor of Science (Medical/Non-Medical) - Semester III

Course Title: Chemistry (Organic Chemistry)

Course Code: BSMM/BSNM-3084(I)

Time: 3 Hours **Max. Marks: 40**

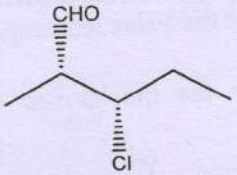
Note: Attempt five questions, selecting atleast one question from each section. The fifth question can be attempted from any section. Each question carries 8 marks.

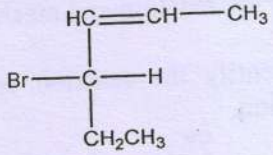
SECTION A

Q1) a) Define enantiomers and diastereomers. How can we distinguish between them? (2)

b) Explain the terms polarised light and specific rotation. (2)

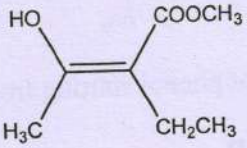
c) Assign R/S to the following (4)

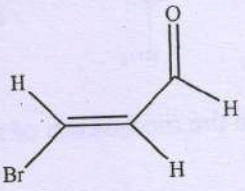




Q2) a) Describe conformational analysis for cyclohexane with the help of energy profile diagram, detailing axial and equatorial positions. (4)

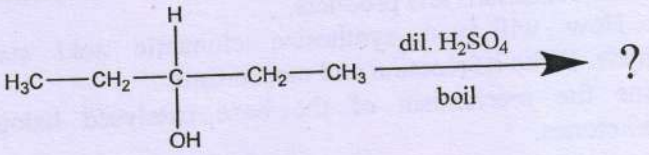
b) Assign E/Z to the following compounds (4)





SECTION B

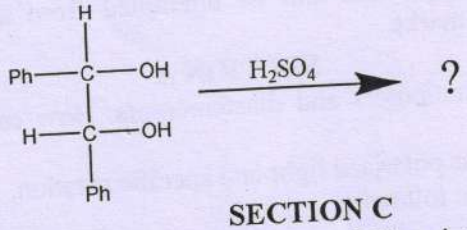
Q3) a) Identify the reaction and write the product with mechanism of following reaction. (4)



b) Briefly discuss why acid catalysed dehydration of tertiary butyl alcohol occurs faster than n-butyl alcohol. (4)

Q4) a) Describe with mechanism the oxidative cleavage of vicinal glycols using lead tetra acetate. (4)

b) Identify the reaction and discuss its mechanism. (4)

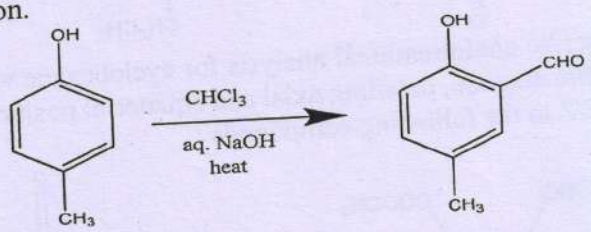


SECTION C

Q5) a) Discuss why phenols prefer electrophilic substitution reactions. (4)

b) Describe the reaction and mechanism of the Fries rearrangement and its significance. (4)

Q6) (a) Identify the reaction and write the mechanism of following transformation. (4)



(b) Outline the mechanism of synthesis of phenol starting from cumene? (4)

Section D

Q7) (a) Discuss synthesis of aldehydes from acid chlorides with mechanism citing relevant example. (4)

(b) Explain the Clemmensen and Wolff-Kishner reductions and compare their conditions and products. (4)

Q8) (a) How will you synthesize cinnamic acid starting from benzaldehyde. Write its reaction and mechanism. (4)

(b) Outline the mechanism of the base catalysed halogenation of enolisable ketones. (4)

Exam Code: 121303 **Paper Code: 3186**

Programme: Bachelor of Science (Semester – III)

Course Title: Chemistry (Physical Chemistry)

Course Code: BSMM/BSNM-3084 (II)

Time: 3 Hours **Max. Marks: 60**

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 12 marks.

Section - A

1. (a) Differentiate between Heat and Work. (2)
   (b) Define Joule-Thomson effect. Discuss experiment and give thermodynamic proof that Joule-Thomson Coefficient for an ideal gas is zero. (5)
   (c) Define Hess's law of Heat Summation. Calculate Heat of formation of benzene at 298K, if the heats of combustion of benzene, carbon and hydrogen are
   -3267.2, -393.5, -285.85 $KJmol^{-1}$ respectively at 298K and 1 atm. (5)
2. (a) Differentiate between Isothermal and Adiabatic process. (2)
   (b) Define Heat capacity. Why there are two types of heat capacities? Derive thermodynamically the relationship between these. (5)
   (c) Define Bond dissociation energy. Calculate bond dissociation energy of C ≡ N bond if ΔH for the reaction
   $H-C\equiv N(g) + 2H_2(g) \rightarrow CH_3-NH_2(g)$ is -150 $KJmol^{-1}$
   Given bond energies of C — H, H — H, C — N, N — H bonds are 414, 435, 293 and 369 $KJmol^{-1}$ respectively. (5)

Section - B

3. (a) Define Second law of thermodynamics. What is the need of this law? (2)
   (b) Define Cyclic process. Describe Carnot cycle working between the temperatures T_1 and T_2 ($T_1 > T_2$). Derive the expression q = w and efficiency for this reversible cycle. (5)

(c) Calculate the entropy change for process when 1 mole of steam is condensed at 373 K, water is cooled to 273K and frozen to ice which is cooled to 250 K. Given Latent heat of fusion of ice = 6028.56 J/mol and Latent heat of vaporization = 40668.84 J/mol, Specific heat capacity of water = 75.312 J/K/mol and Specific heat of ice is 37.656 J/K/mol. (5)

4. (a) State Carnot theorem with expression. (2)
(b) Define and discuss thermodynamic scale of temperature. Prove its identity with ideal gas temperature scale. (5)
(c) Discuss and derive entropy criteria of spontaneity and equilibrium. (5)

Section – C

5. (a) Why A and G have an advantage over S as a criterion for thermodynamic equilibrium and spontaneity? (2)
(b) Explain the concept of Residual Entropy? Discuss the method for evaluation of absolute entropy from heat capacity data. (5)
(c) Define law of mass action. Discuss thermodynamic derivation of law of mass action. (5)

6. (a) Define Equilibrium constant. Give its relationship with free energy. (2)
(b) Derive Gibb's Helmholtz equation relating; (i) ΔG and ΔH (ii) ΔA and ΔE. Give its applications also. (5)
(c) Derive Clausius Clapeyron equation. Give its applications. (5)

Section – D

7. (a) Differentiate between compounds with congruent and incongruent melting point. (2)
(b) Draw and discuss Phase diagram of water system. (5)
(c) What is meant by Nernst distribution law? Discuss its thermodynamic derivation and applications. (5)

8. (a) Define triple point of water with its temperature and pressure. (2)
(b) Draw and discuss phase diagram of Pb-Ag system. Give its application. (5)
(c) Discuss partially miscible liquid systems with upper and lower consolute temperature. (5)

Exam Code: 121303 **Paper Code: 3187**

Programme: Bachelor of Science (Semester – III)

Course Title: Botany (Structure, Development, Reproduction in Flowering Plants –I)

Course Code: BSMM – 3075 (I)

Time Allowed: 3 Hours **Maximum Marks: 40**

Note: Candidates are required to attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries eight marks.

Section A

1. Write a detailed note on diversity of forms of annual plants.
2. What is growth? Discuss monopodial and sympodial growth.

Section B

3. What is cambium in shoot system? Discuss its importance.
4. Write a detailed note on formation of secondary xylem.

Section C

5. Write a detailed note on wood structure in relation to water conduction.
6. What is secondary phloem? Discus its structure and function.

Section D

7. Discuss internal structure of leaf in relation to water loss.
8. Write a detailed note on diversity of shape and size of leaf.

Exam Code: 121303 **Paper Code: 3188**

Programme: Bachelors of Science (Semester: III)

Course Title: Botany (Structure, Development and Reproduction in Flowering Plants - II)

Course Code: BSMM-3075 (II)

Time Allowed: 3 Hours **Max Marks: 60**

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 12 marks. Draw labelled diagrams wherever necessary.

SECTION-A

1 How do roots interact with various microbes? Explain with examples. 12

2 Write short note on :

a. Internal anatomy of respiratory root. 6

b. Origin of lateral root 6

SECTION-B

3 What is grafting? Explain various grafting techniques with suitable diagrams and examples, and discuss the economic importance of grafting. 12

4 Write note on following :

a. Layering b. Cutting 6+6

SECTION-C

5 Describe structure and development of male gametophyte in angiosperm. 12

6 What is pollen-pistil interaction, and how does it regulate fertilization in flowering plants? 12

SECTION-D

7 What is endosperm,how is it formed? Describe with suitable diagrams, various types of endosperms in angiosperms. 12

8 a. In what ways do seeds act as units of genetic recombination, and why is this important for genetic diversity? 4

b. Explain different strategies for seed dispersal. 8

Exam Code: 121303 Paper Code: 3189
(20)

Programme: Bachelor of Science
Semester-III

Course Title: Food Science and Quality Control (Vocational)
(Food Processing and Packaging)

Course Code: BSMM-3255

Time Allowed: 3 Hours **Max Marks: 60**

Note:- Candidates are required to attempt five questions selecting one question from each section. The fifth question may be attempted from any selection. Each question carries 12 marks.

Section A

1. a) What are lipids? Differentiate between fats and waxes? Draw the structure of triglyceride and monoglyceride? 8
   b) What are sources of fats and oils? How fats are extracted? 4
2. a) What are carbohydrates? Describe about different type of carbohydrates? 4

b) What are the sources of sugar? Different type of sugars? Briefly describe about the sugar extraction process from sugarcane? 7

c) Which sugar is sweetest? 1

Section B

3. a) What is the principle of extrusion Technology? Describe about different processing parameters of extrusion? 6

   b) What are the different types of extrusion? Advantages of extrusion and draw the diagram of extrusion processing? 6

4. a) What are enzymes? Describe about different types of enzymes with examples? 6

   b) What are the factors affecting enzyme activity? 6

Section C

5. a) What is vinegar'? Differentiate between wine and fruit wine? 4

   b) Describe about the processing of wine and its FSSAI specification? 8

6. a) What are spices? What is the importance of spices in Food Processing? 4

b) What is the food additive? What are the different types of addatives? Explain about preservatives? 8

Section D

7. a) What is glass? Importance of glass in food packaging? Advantages and disadvantages of glass packaging? 8

   b) Differentiate between CAP and MAP? 4

8. a) What is food packaging? What are the functions of food packaging? What do you mean by PVC? 8

   b) Write about packaging of meat? 4

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Exam Code: 121303 **Paper Code: 3190**

Programme: Bachelor of Science (Semester – III)

Course Title: Physics (Statistical Physics and Thermodynamics)

Course code: BSNM / BCSM – 3395 (I)

Time: 3 Hours **Max Marks: 60**

Instructions: Candidates are required to attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries equal (12) marks. Students can use Non-Scientific calculator or logarithmic tables.

Section A

1. (a) Eight distinguishable particles are distributed in 2 compartments of unequal sizes. The first compartment is further divided into 6 cells and the second into 2 cells of equal sizes. Each cell is of equal apriori probability and there is no restriction on the number of particles that can be contained in each cell. Calculate the probability of
   (i) macrostate (6,2) and (ii) the most probable macrostate. (6)
   (b) A large number of n particles are distributed in 2 compartments of equal apriori probability. Discuss the variation of probability of a macrostate on account of a small deviation from the state of maximum probability. Also plot your observations. (6)

2. (a) Prove that for a dynamic system the fraction of the total time that the system spends in any particular macrostate, is proportional to the probability of the system to exist in that macrostate. (6)
   (b) n similar coins are tossed simultaneously for a large number of times. Prove that the probability of getting r heads up is

$$\frac{n!}{r!\,(n-r)!} \times \frac{1}{2^n}$$

Hence find (i) the probability of most probable state and
(ii) the probability of least probable combination. (6)

Section B

3. Apply the Fermi Dirac distribution law to derive the energy distribution of free electrons inside a conductor. Also discuss the behaviour of these electrons at 0 K and higher temperatures. (12)

4. Discuss basic approaches in three statistics. Prove that for short wavelengths, the blackbody radiation obeys the radiation law $E(\lambda)d\lambda = C_1 \lambda^{-5} e^{-C2/\lambda t} d\lambda$, where C_1 and C_2 are constants. (12)

Section C

5. (a) The coefficient of performance of a refrigerator becomes infinite when the temperature of two bodies becomes equal. Why? (4)

   (b) Why does entropy increases during free expansion of gasses? Explain. (4)

   (c) Define two specific heats and develop the relation $C_P - C_V = R$. (4)

6. What is Carnot's cycle? On what factors does the efficiency of reversible Carnot's cycle depend? What did this lead Lord Kelvin scale to? (12)

Section D

7. (a) Derive Clausius- Clayperon's equation from Maxwell's relations and explain the change of ice into water on the basis of it. (6)

   (b) Deduce isothermal change of internal energy with volume of a real and ideal gas by establishing energy equation.

$$\left(\frac{\partial U}{\partial V}\right)_T = T\left(\frac{\partial P}{\partial T}\right)_V - P$$ (6)

8. (a) Prove that for any substance $TdS = CvdT + T\left(\frac{\partial P}{\partial T}\right)_V dV$ (6)

   (b) Prove that cooling is produced when substance which contracts on heating is compressed. And hence prove that

$$dT = -\frac{T\alpha V dP}{C_P}$$ (6)

Exam Code: 121303 **Paper Code: 3191**

Programme: Bachelor of Science (Semester – III)

Course Title: Physics (Optics and Laser)

Course Code: BSNM/BCSM-3395(II)

Time: 3 Hours **Max. Marks: 40**

Note: Candidates are required to attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 8 marks. Use of log table / non programmable calculator is allowed

Section A

1. Explain the principle and working of Michelson interferometer. On moving a movable mirror in Michelson Interferometer through 2.3×10^{-4}m, 790 fringes are observed to cross the field of view. Calculate λ. (8)

2. a) Derive an expression for net amplitude on superposition of two waves in young double slit interference and derive the conditions of maxima in terms of path difference as well as phase difference. (5)
   b) State and prove Stoke's Law. (3)

Section B

3. State and explain Rayleigh's criterion for limit of resolution. Derive an expression for resolving power of microscope and telescope. (8)

4. Explain the concept of Zone plate and prove that it behaves as a convergent lens. Distinguish between Convex lens and Zone plate. (8)

Section C

5. What is double refraction? How will you produce circular and elliptical polarised light? (8)

6. a) What is Wire grid polarizer? Explain how it can be used to produce polarization of light. (6)
   b) If Brewster angle is 60^0, find the refractive index of the material. (2)

Section D

7. a) Explain the principle, construction and working of a He-Ne laser. (6)
   b) The coherence length for sodium D_2 line is 2.5 cm. Deduce the coherence time t_c. (2)

8. a) What are Einstein co-efficients ? Show that they are related as $B_{12} = B_{21} and \frac{A_{21}}{B_{21}} = \frac{h\omega^3}{\pi^2 c^3}$ (5)
   b) Discuss applications of laser in communication and in medicine. (3)